

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard				SIS		
B01 = Trouble-shooting chart	A	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	B	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	C	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	D	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	E	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	F	XXXXX	XXXXX	XXXXX	XXX	
	G	XXXXX	XXXXX	XXXX		
	H					
	J					
	K					
	L					
	M					
N01 = Service information	N	*XXXX	XXXXX	XXXXX	XXX	*X XX*
		12345	67890	12345	67890	12345 678
			1		2	
						Index
N28 = Table of contents and publication information						

- 1 = Special features
2 = Safety and precautionary measures
3 = Testers and tools
4 = Installation position of components

- a. Read from left to right.
b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

<u>==></u>	<u><==</u>	<u><==</u>	<u>=> <=</u>
Beginning	Mid-section	End	One-page section

A01		=> <=
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HOW TO USE THIS MICROCARD

Trouble-shooting instructions for system:

EI

Descriptions, photographs, terminal designations and special features refer to the following vehicle:

OPEL CORSA-A GSi
1.6 l /4-cyl. engine E 16 SE 3.88 ->

These basic instructions are comprehensive trouble-shooting instructions. They must not be used as vehicle-specific instructions. Caution! Descriptions and photographs may deviate from the vehicle-specific brief instructions.

Mandatory set values, terminal assignments and special features should be taken from the vehicle-specific brief instructions only. For brief instructions, see table of contents Microcard KFZ-00..

A02		=> <=
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SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

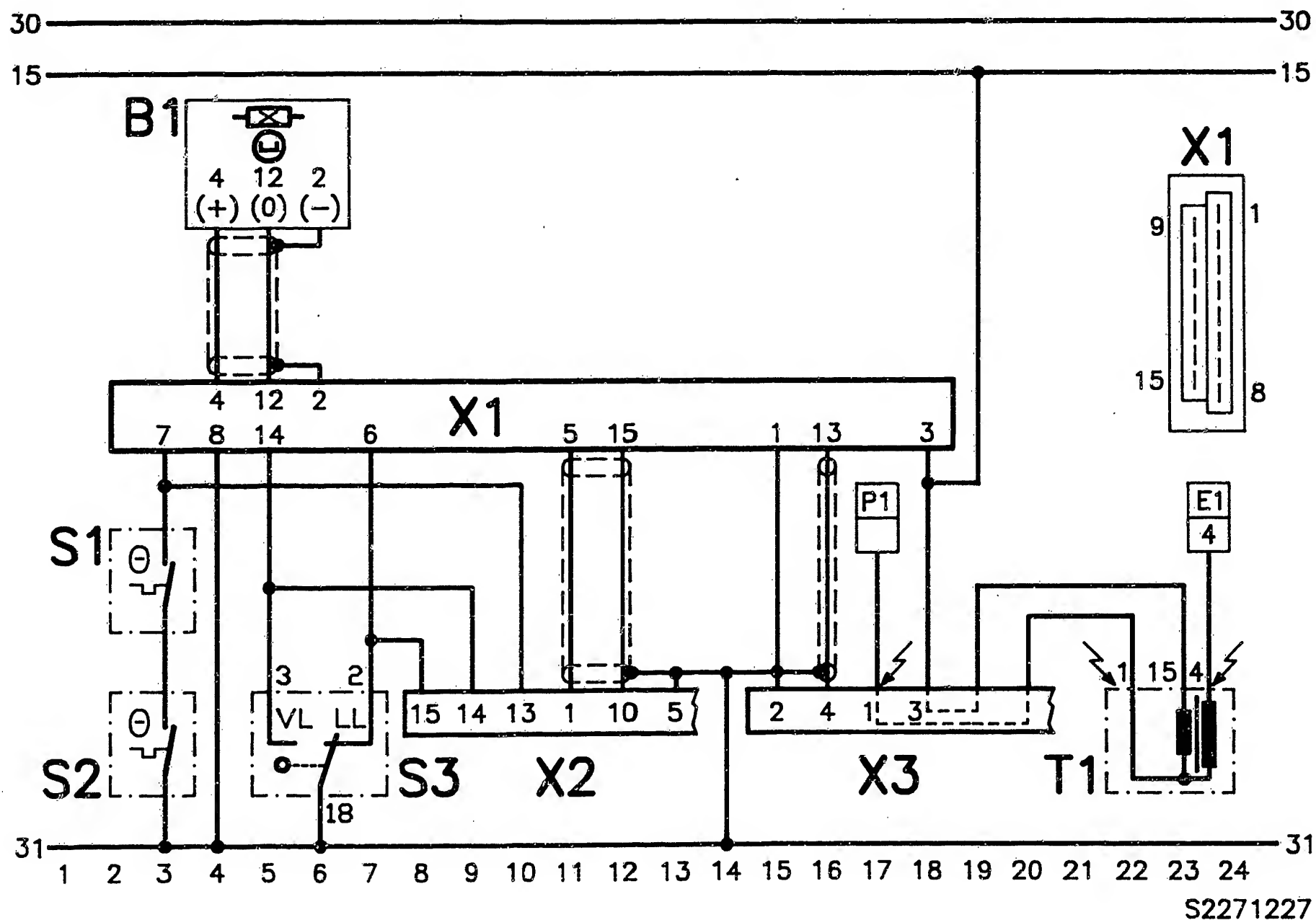
CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

In this connection we should like to point out that VDE Regulations (in particular VDE 0104/7.67) and the pertinent local regulations are to be adhered to when performing work on or testing the ignition system.

For production reasons:
continued on the following
coordinate.



High-tension arrows: Caution 400 V...25 kV

T1 = Ignition coil

X3 = Trigger-box plug

SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Taking the terminal diagram of an electronic ignition system as an example, the hazardous locations are marked with high-tension arrows.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

Never start engine without battery securely connected (battery terminals tightened).
Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.
Provide starting assistance only with second 12 V battery and jump leads.
Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures above + 80° C (paint-drying installation).

Remove control units before carrying out electric welding work.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

When testing compression, detach trigger-box plug or permanently connect ignition coil term. 4 to ground with auxiliary cable (hazardous high tension, insulation damage on ignition coil, ignition distributor, ignition harness).

Note :

Auxiliary cable must feature at least 2 k Ω interference suppression, e.g. sleeve-type suppressor (5 k Ω)
0 356 500 001.

Prescribed ignition coil (see part no.) is not to be replaced with a different ignition coil.

An interference-suppression capacitor is not to be connected to term. 1 of the ignition coil.

The positive terminal of the battery is never to be connected to term. 1 of the ignition coil as this will destroy the trigger box.

Do not short-circuit term. 1 of ignition coil to ground (e.g. to switch off engine), as this will destroy the ignition coil and possibly also the trigger box.

Ignition cable from ignition coil and ignition distributor term. 4 must not be detached during operation.

There must be no voltage flashover from term. 4 of the ignition coil to term. 1 and term. 15 of the ignition coil.

The secondary side of the ignition system must feature at least 2 k Ω interference suppression, so as to prevent destruction of the trigger box. The original distributor rotor must be fitted with 1 k Ω .

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

Incorrect indication of engine speed, dwell angle and ignition point:

With this ignition system (trigger box with current limitation) there is a possibility of an incorrect indication of engine speed, dwell angle and ignition point on testers.

Refer to coordinates N10...N17 for more detailed information

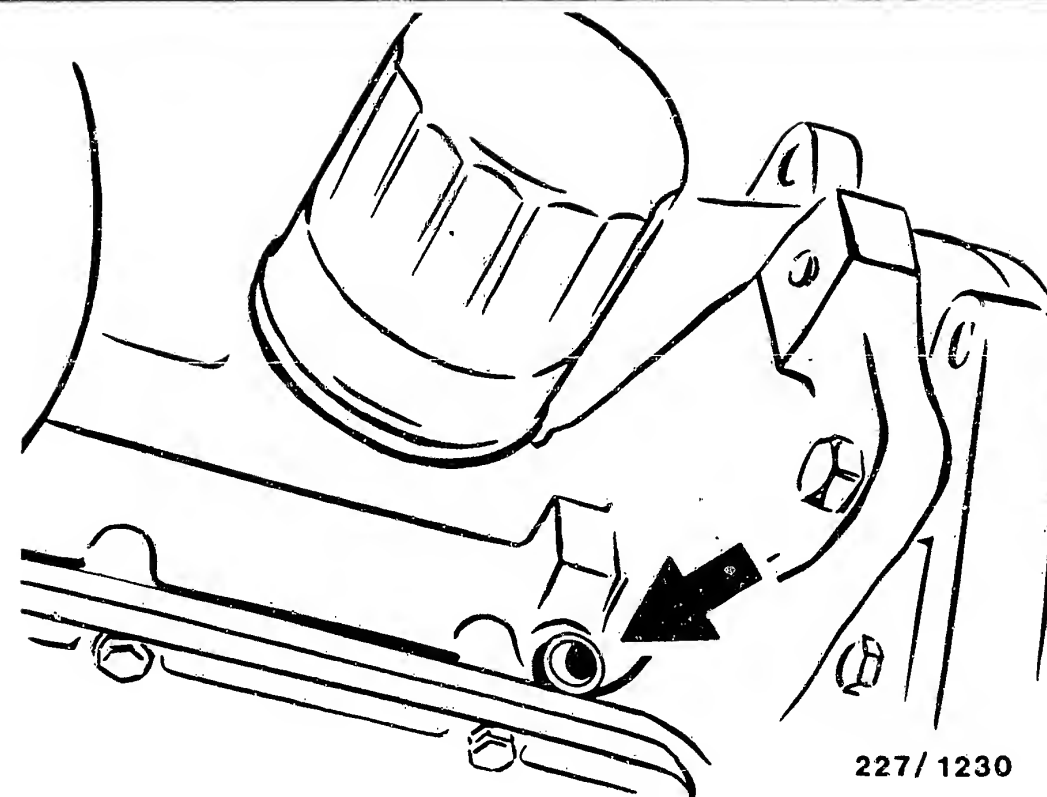
TESTERS AND TOOLS

Motortester e.g. Mot 206	0 684 000 206
Shorting device (for basic ignition setting)	KDZS 0003
TDC sensor	1 687 224 633 .. 655
Sleeve-type suppressor 5 k Ω	0 356 500 001
Ohmmeter ETE 014.00 or e.g. Pontavi Wh 2	0 684 101 400 Comm. avail.
Voltmeter e.g. ETE 014.00	0 684 101 400
Test leads (for proper connection of testers to connectors)	KDZS 0004 KDZS 0005
Black test prod Red test prod (for proper connection of testers to connectors)	1 684 485 034 1 684 485 035
Connecting cable for ignition coil (for term. 1 green)	1 684 443 055
Connecting cable for ignition coil (for term. 15 yellow)	1 684 443 054

TESTERS AND TOOLS (CONTINUED)

Resistance decade O R	Comm. avail.
Individual resistor between 240 and 270 Ω (equal to/greater than 125 mW)	Comm. avail.

2 auxiliary leads for user- production consisting in each case of approx. 90 mm cable 1.5 mm ²	6 210..
4 blade terminals e.g.	8 784 480 011

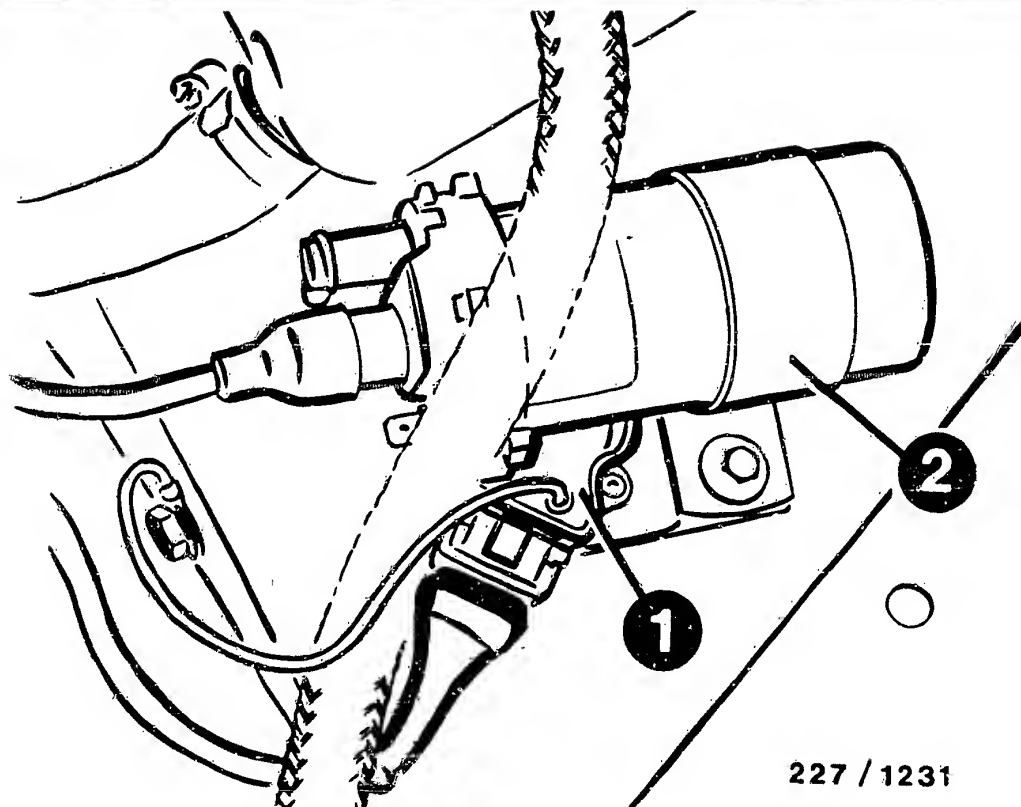


Arrow = Sleeve (hole) for TDC sensor

INSTALLATION POSITION OF COMPONENTS

The sleeve for the TDC sensor is located at the cylinder block (beneath oil filter).
See picture.

Motortaster (TDC sensor) connection:
Remove plug (see picture) and insert TDC sensor as far as it will go into sleeve.

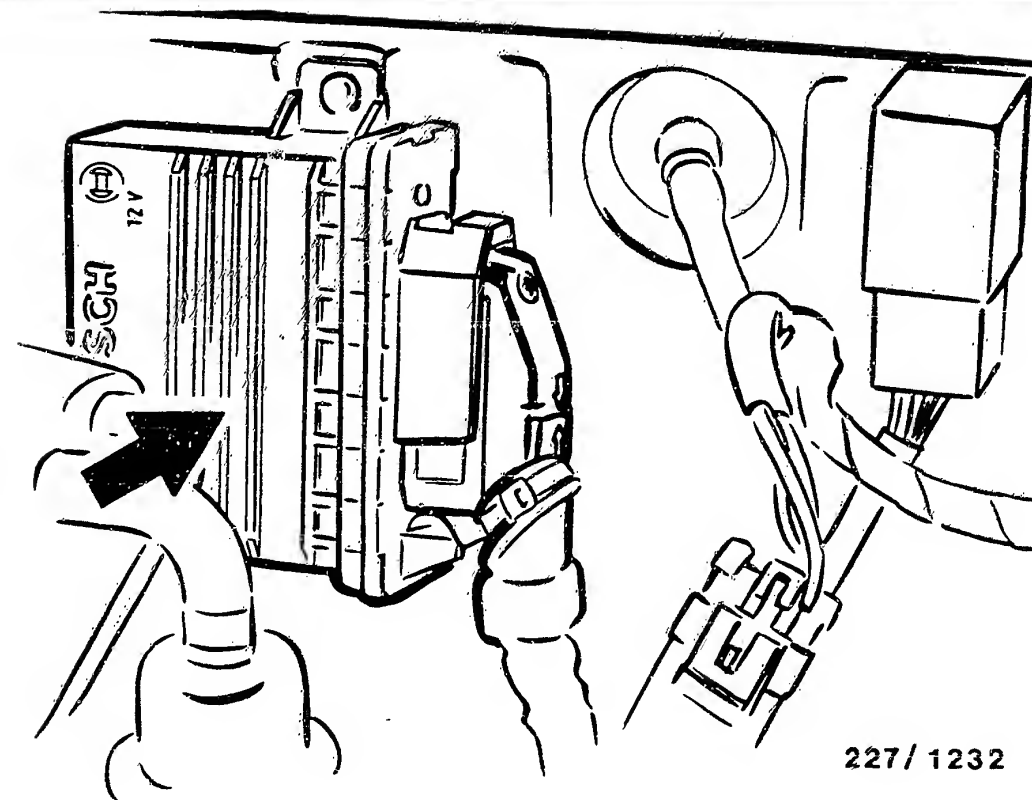


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- 1 = TI trigger box
- 2 = Ignition coil

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The trigger box and ignition coil are installed on a joint heat sink and are located at the wheel house, front left.

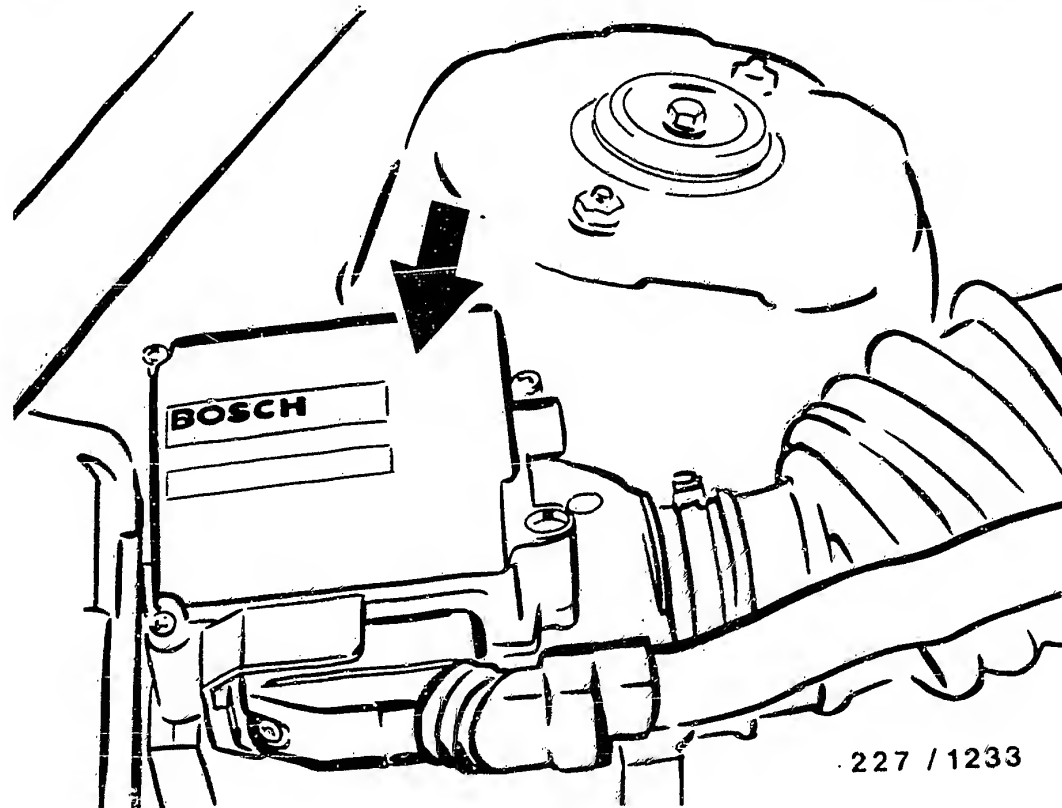


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Arrow = Ignition advance unit

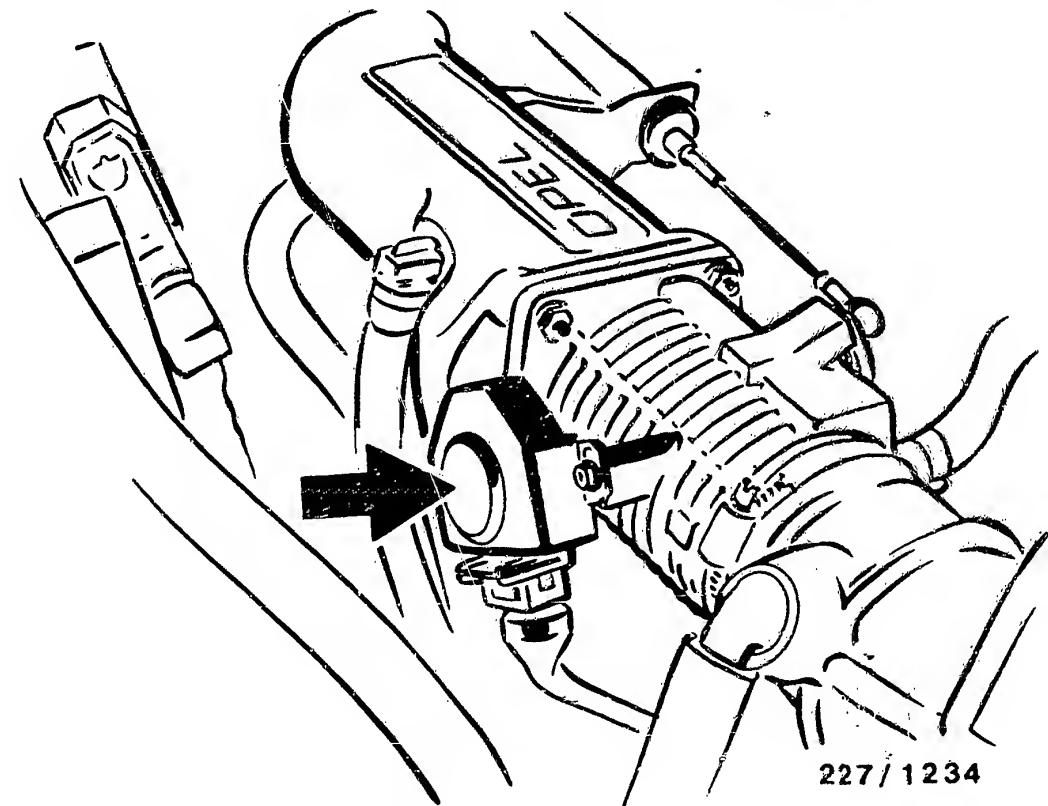
INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The ignition advance unit is located at the bulkhead of the engine compartment. See picture, arrow.



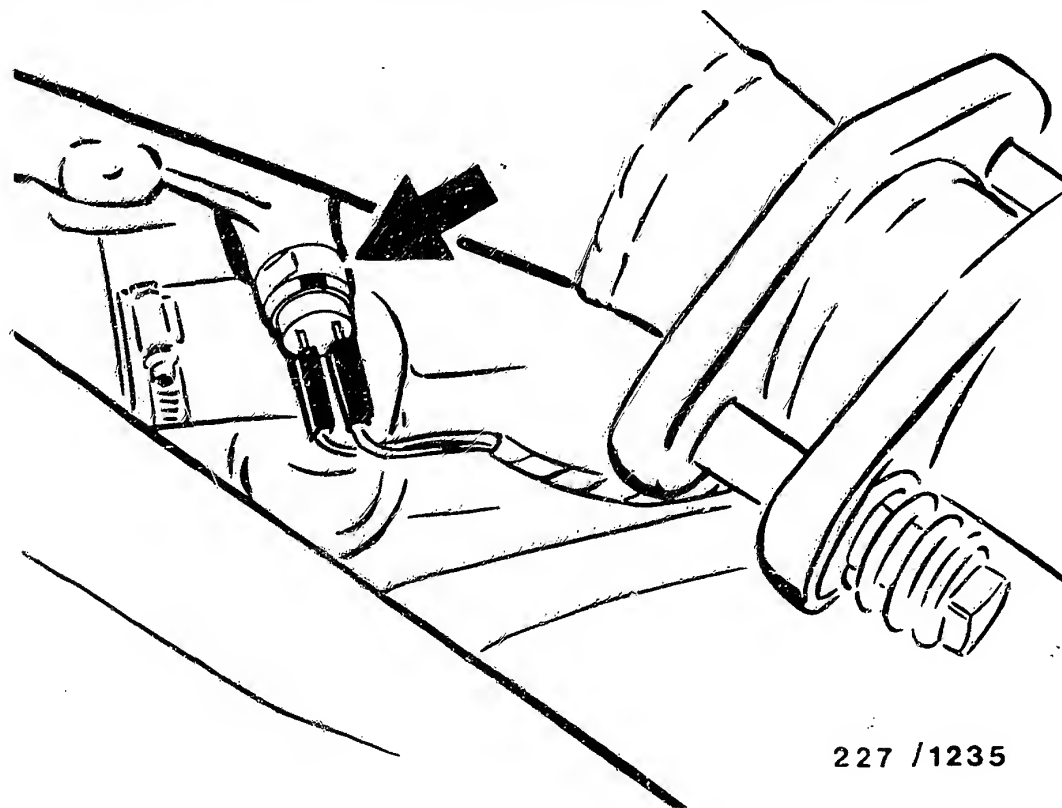
Arrow = Measurement and control facility (LE-Jetronic)
consisting of air-flow sensor and control unit.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)



Arrow = Throttle-valve switch

INSTALLATION POSITION OF COMPONENTS (CONTINUED)



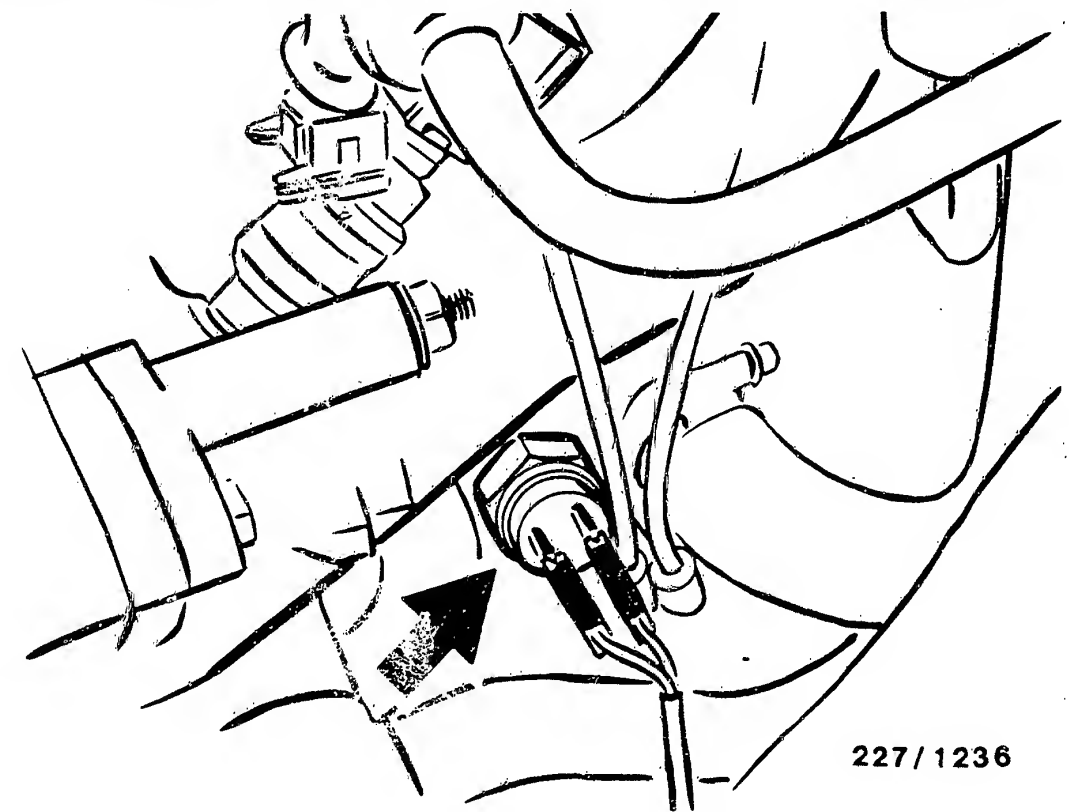
227 /1235

Arrow = Temperature switch (oil)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The temperature switch is located at the cylinder block beneath the alternator.

Tightening torque: 20 Nm.



227 /1236

Arrow = Temperature switch (intake manifold)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The temperature switch is located at the intake manifold.
Tightening torque: 6 Nm

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts with Coordinate B04 and contains customer complaint (fault symptom/fault characteristic feature) together with several possible causes in each case (component faults) and coordinate information for detailed trouble-shooting. If no coordinates are given, this is because the causes concerned do not require any test instructions. In the event of a clearly established customer complaint, proceed consecutively and step by step as indicated in the trouble-shooting instructions in the stated sequence of possible causes.

Trouble-shooting should always be commenced with self-diagnosis (if provided) or with the universal test adapter (if envisaged). Only then should trouble-shooting be continued in line with the trouble-shooting chart.

In the event of a customer complaint which is not clear-cut, all causes indicated in the trouble-shooting chart must be tested. In order to avoid incorrect measurements, all causes are to be checked in the specified sequence (on account of interlinkage of test steps).

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

The TROUBLE-SHOOTING PROGRAM contains all system and component tests indicated in the trouble-shooting chart. It is sub-divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/connection diagrams linked to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

If the answer to the question is "no", the center column must be applied and the tests performed in the sequence indicated there.

Following fault elimination, repeat test as a check.

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

TEST PREREQUISITES:

- Battery fully charged
- Engine in proper mechanical working order (e.g. compression, valve clearance etc.)
- Engine at operating temperature of approx. +80°C (if necessary)
- Proper connection of all connectors of wiring harness

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on.
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)										Coord.
*			*							B07
*										Firing sequence
*			*							B09
*										Ignition coil
*										Ignition-distributor installation setting
*										B11
*										Trigger-box voltage
*										B13
*										Primary circuit
*										B15
*										Ignition-advance-unit voltage
*										B17
*										Ignition-distributor plug and socket
*										B19
*										Magnetic-pulse-generator voltage
*										B21
*										Magnetic-pulse-generator function
*										B23
*										Ignition-advance-unit function
*										B25
*										Contact resistance (primary side)
*										C03
*										Engine-speed signal
*										C05
*										Primary signal
*										C07
*	*	*	*	*	*	*	*	*	*	Basic ignition setting
										C09

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

										Cause (component fault)	Coord.
			*	*						Control lead, characteristic curve control	C11
			*	*						Temperature switch (oil)	C13
			*	*						Temperature switch (intake manifold)	C15
	*	*	*	*						Throttle-valve switch, idle	C17
			*	*						Throttle-valve switch, full load	C21
			*	*						Load signal	C23
						*				RON correction	D01
		*								Trigger-box voltage (engine idling)	D03
		*								Ignition-coil voltage (engine idling)	D05

For production reasons:
continued on the following
coordinate.

TROUBLE-SHOOTING PROGRAM (1)

V

Test high-voltage side.

N>

Repair high-voltage side.

Test spark plugs, spark-plug connectors, suppression resistors, H.T. ignition cables, distributor cap, distributor rotor etc. for proper operation (e.g. open circuit, shunt).

Assessment e.g. through ignition oscillogram, resistance measurements and visual check.

High-voltage side O.K.?

Y

Return to trouble-shooting chart
B04

V

B07

==>

B08

<==>

TROUBLE-SHOOTING PROGRAM (2)

Check ignition coil

Visual examination:

Remove protective cap from ignition coil and check whether plug is in position and whether sealing compound has escaped.
See picture.

Electrical check:

Ignition coil primary term. 15 and term. 1

(Take resistance of test lead and test prods into account)

Set value: see brief instructions

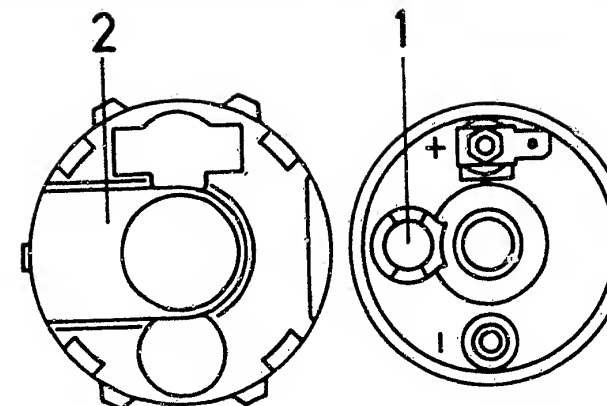
Ignition coil secondary term. 1 and term. 4

Set value: see brief instructions

Visual examination O.K./set value obtained?

N>

1. If there is no plug or if sealing compound has oozed out, renew ignition advance unit, as well as trigger box and ignition coil.
2. If set values are not O.K., renew ignition coil.



227/0055

1 = Plug
2 = Protective cap

Return to trouble-shooting chart
B04

B09

<=>

B10

<=>

TROUBLE-SHOOTING PROGRAM (3)

Test ignition-distributor installation setting.

N>

Adjust ignition distributor.

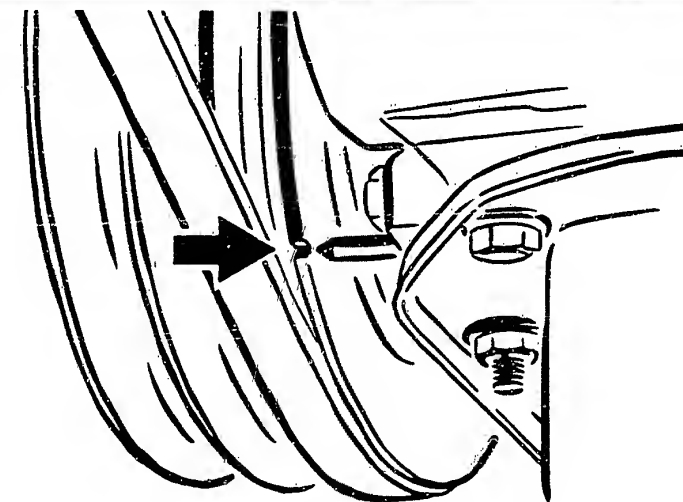
Set crankshaft cyl. 1 to pulley mark (10° v. BTDC).
See top picture.

Remove cap, distributor rotor and dust-protection cover from ignition distributor.

Attach distributor rotor.

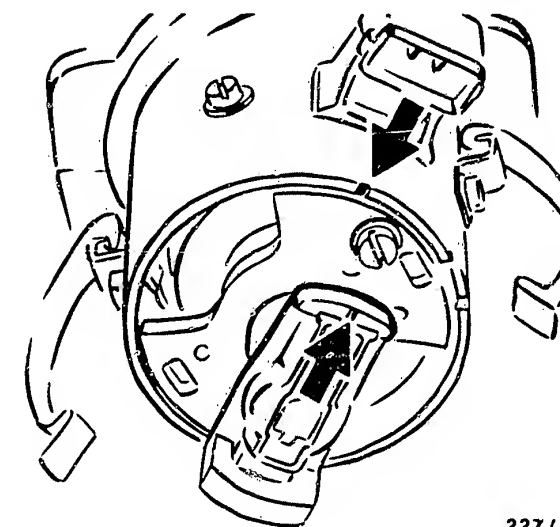
The distributor rotor must be set such that the center of the distributor-rotor electrode faces the housing mark, cyl. 1.
See bottom picture, arrow.

Ignition-distributor installation setting O.K.?



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Return to trouble-shooting chart B04



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TROUBLE-SHOOTING PROGRAM (4)

Check voltage to trigger box.

Disconnect trigger-box plug
and connect voltmeter to term. 3
(+) and term. 2 (-).
See picture.

Switch on ignition.

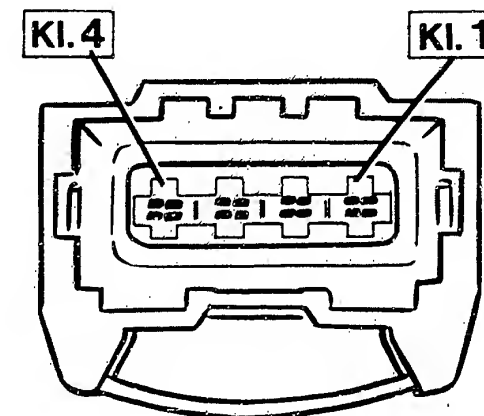
Set value: battery voltage

Set value obtained?

N>

Check for open circuit in leads
and connections between ignition/
starting switch and trigger-box
plug term. 3 including ground
lead term. 2.

Eliminate open circuit.



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Return to trouble-shooting chart
B04

B13

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B14

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TROUBLE-SHOOTING PROGRAM (5)

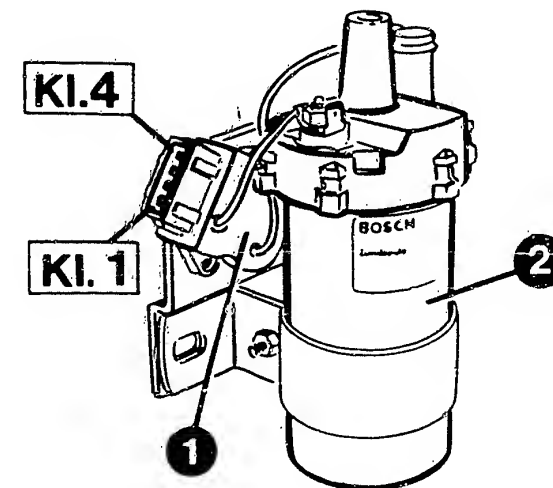
Test primary circuit.

Detach trigger-box plug.
Connect ohmmeter to trigger box
term. 1 and term. 3.
See picture.

Set value: approx. 1 Ω
(continuity)

Is set value attained?

Renew trigger box.



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Return to trouble-shooting chart
B04

B15

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B16

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TROUBLE-SHOOTING PROGRAM (6)

Test ignition-advance-unit voltage.

Detach ignition-advance-unit plug and connect voltmeter to term. 3 (+) and term. 1 (-). See picture.

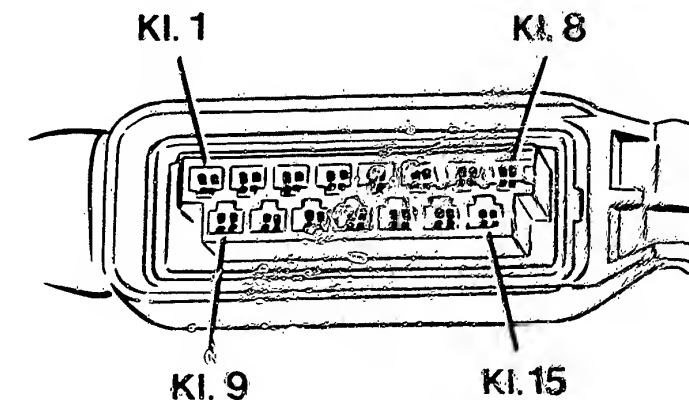
Switch on ignition.

Set value: Battery voltage

Is set value attained?

N>

Test for open-circuit in leads and connections from ignition and starting switch to ignition-advance-unit plug term. 3 including ground lead term. 1.
Eliminate open-circuit.



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Return to trouble-shooting chart B04

B17

<==>

B18

<==>

TROUBLE-SHOOTING PROGRAM (7)

Test ignition-distributor plug and ignition-distributor socket.

N>

Eliminate oxidation.

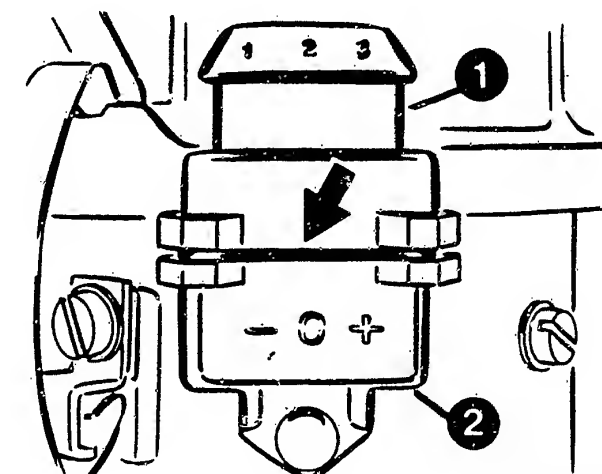
Press wire clip of ignition-distributor plug.
See upper illustration, arrow.

Remove ignition-distributor plug.

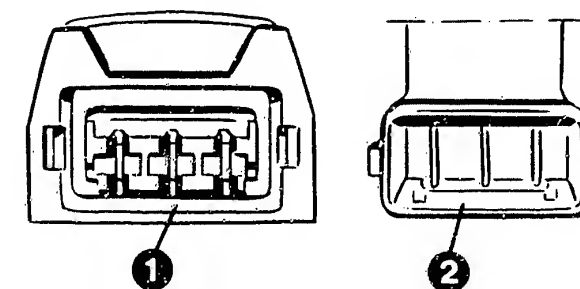
Visual examination:

Test contacts of ignition-distributor plug and ignition-distributor socket for oxidation.

Contacts O.K.?



1 = Ignition-distributor plug
2 = Ignition-distributor socket



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Return to trouble-shooting chart B04

B19

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B20

<=>

TROUBLE-SHOOTING PROGRAM (8)

Test magnetic-pulse-generator voltage.

Ignition-distributor and ignition-advance-unit plug connected.

Push back rubber sleeve of ignition-distributor plug.

Connect voltmeter to ignition-distributor plug term. 4 (+) and term. 2 (-).
See top picture.

Switch on ignition.

Set value equal to/greater than 10 V

Is set value attained?

N>

Detach ignition-distributor and ignition-advance-unit plug.

Connect ohmmeter consecutively to:

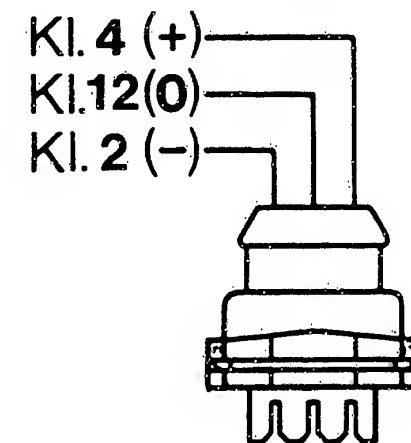
Ignition-distributor plug

Ignition-advance-unit plug (bottom picture)

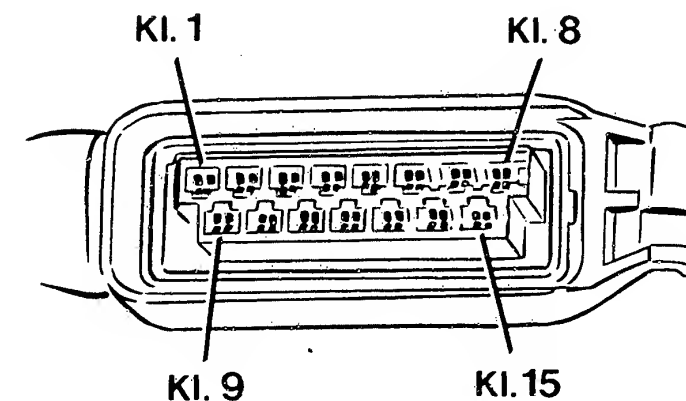
Term. 4 and term. 4
Term. 2 and term. 2

Set value: approx. 0 Ω in each case (continuity)

Eliminate open-circuit.



227/966



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Return to trouble-shooting chart B04

B21

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B22

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TROUBLE-SHOOTING PROGRAM (9)

Test magnetic-pulse-generator function.

Ignition-distributor and ignition-advance-unit plug connected.

Push back rubber sleeve of ignition-distributor plug.

Connect oscilloscope in program-selector-switch setting "special" in accordance with operating instructions.

For example MOT 206:

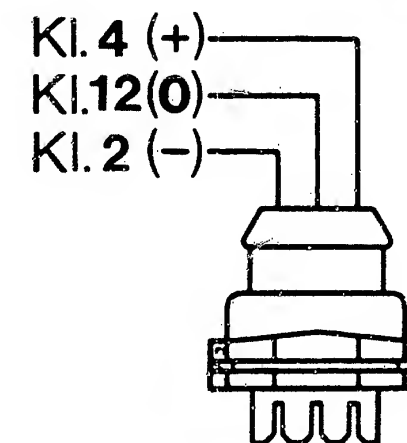
Red clip to ignition-distributor plug term.12 (measurement signal).
See top picture.
Black clip to vehicle ground.

Start engine.

Oscilloscope must indicate rectangular pulse.
See bottom picture.

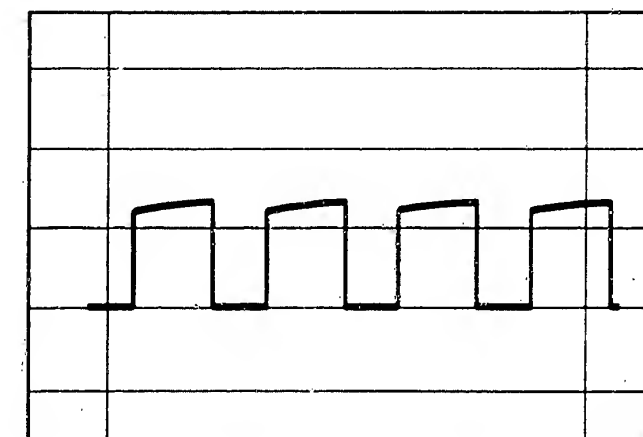
Rectangular pulse present?

Replace magnetic pulse generator and/or ignition distributor.



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Rectangular pulse



227/0096

Return to trouble-shooting chart B04

TROUBLE-SHOOTING PROGRAM (10)

Test ignition-advance-unit function.

N>

Ignition-distributor, trigger-box and ignition-advance-unit plug connected.

Push back rubber sleeve of trigger-box plug.

Connect oscilloscope in program-selector-switch setting "special" in accordance with operating instructions.

For example MOT 206:

Red clip to trigger-box plug term. 4 (measurement signal).
See top picture.

Black clip to vehicle ground.

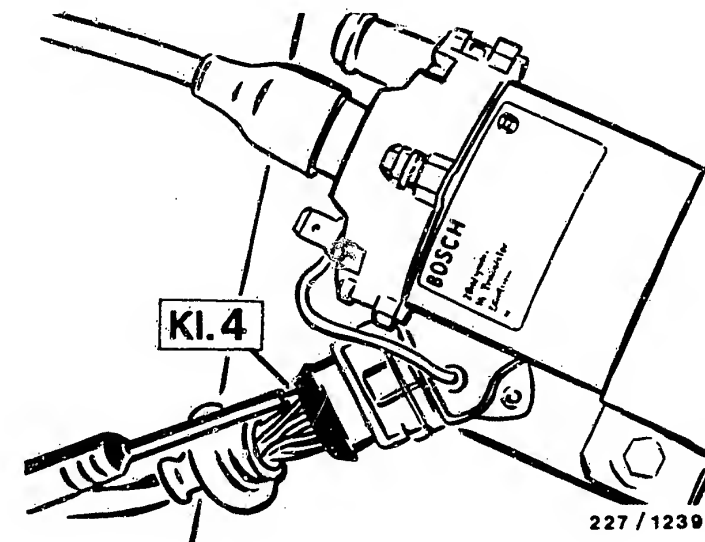
Start engine.

Oscilloscope must indicate rectangular pulse of at least 2,5 V.
See bottom picture.

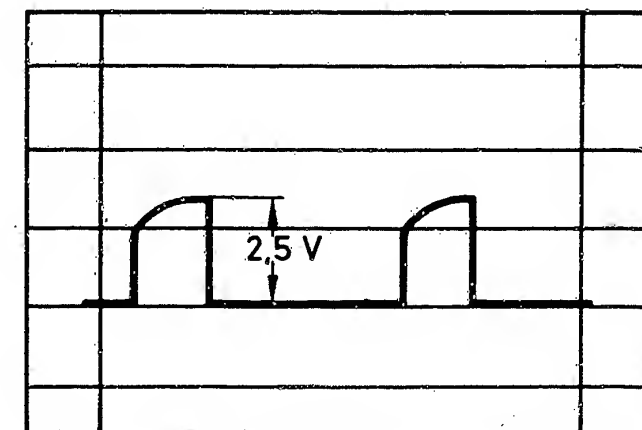
Note: The important factor is the minimum voltage and not the profile (edges may be smooth).

Rectangular pulse present?

Detach ignition-distributor, trigger-box and ignition-advance-unit plug.



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227/1224

Return to trouble-shooting chart B04

Continued on next picture page

Consecutively connect ohmmeter to:

Ignition-distributor plug (top picture)	Ignition-advance-unit plug (center picture)
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Term. 12 and term. 12

Ignition-advance-unit plug	Trigger-box plug (bottom picture)
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Term. 13 and term. 4

Set value approx. 0 Ω in each case (continuity).

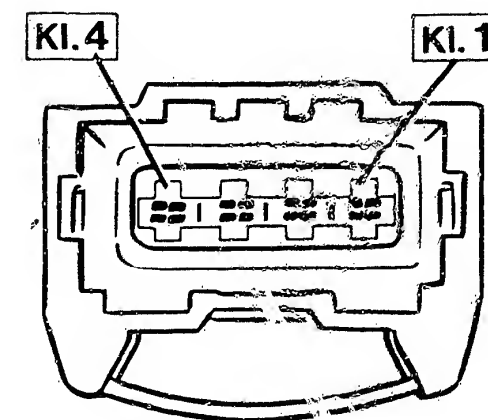
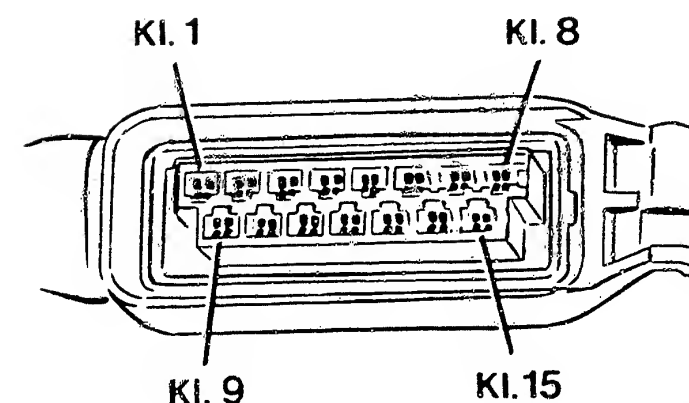
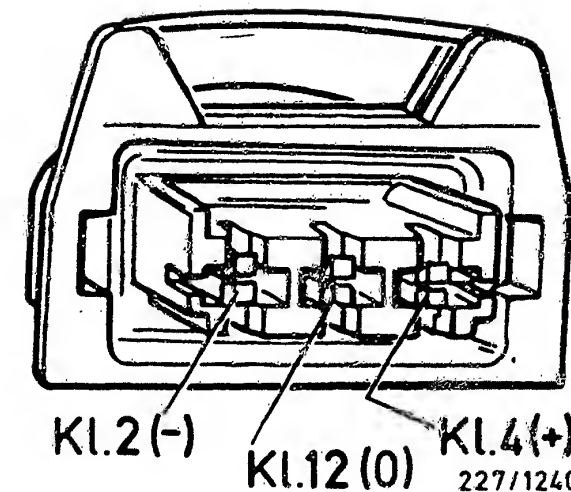
Eliminate open-circuit.

Trigger-box plug	Trigger-box plug
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Term. 4 and term. 2

Set value: infinity Ω
(open-circuit)

Eliminate short-circuit to ground.



Continued on next picture page

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Attach ignition-distributor and
ignition-advance-unit plug.

Connect resistor between 240 and
270 Ω at detached trigger-box plug
term. 4 and term. 2.
See top picture.

Oscilloscope "special" with red
clip to trigger-box plug
term. 4 (+).
See top picture.
Black clip to vehicle ground.

Start engine.

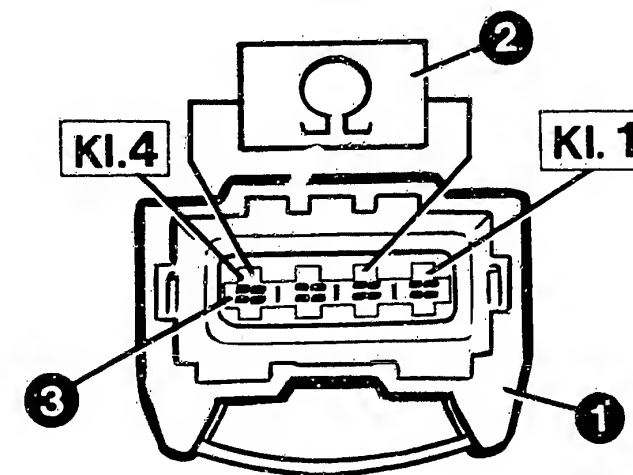
Oscilloscope must indicate a
rectangular pulse of at least 2,5 V.
See bottom picture.

Note: The important factor is the
minimum voltage and not the profile
(edges may be smooth).

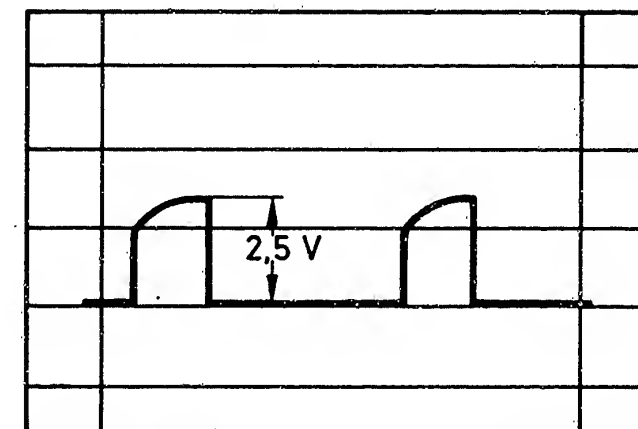
If set value is attained, renew
trigger box.

If set value was not attained,
renew ignition advance unit.

Return to trouble-shooting chart
B04



1 = Trigger-box plug
2 = Resistor 240...270 Ω
3 = to oscilloscope



227/1224

TROUBLE-SHOOTING PROGRAM (11)

Check contact resistance
(primary side).

Disconnect negative and positive
leads from battery.

Disconnect trigger-box plug.
See picture.

Switch on ignition.

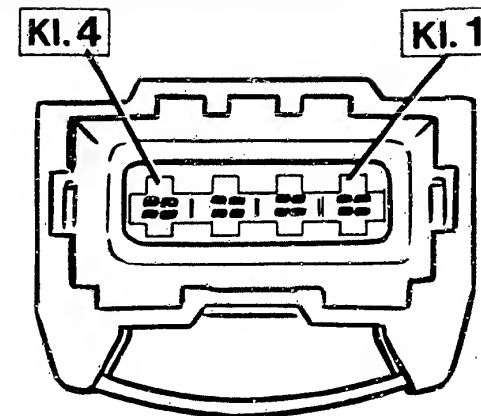
Check for contact resistance
in leads between positive
battery terminal and trigger-
box plug term. 3 including
leads between negative battery
terminal and trigger-box plug
term. 2.

(Take resistance of test lead/
test prods into account.)

Set value: see brief instructions

Set value obtained?

Eliminate contact resistance.



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Return to trouble-shooting chart
B04

C03



C04



TROUBLE-SHOOTING PROGRAM (12)

Test engine-speed signal.

Negative and positive lead of battery connected.

Trigger-box plug connected.

Detach LE-Jetronic control-unit plug.

See top picture.

Connect oscilloscope in program-selector-switch setting "special" in accordance with operating instructions.

For example MOT 206:

Red clip to LE-Jetronic control-unit plug term. 1

(measurement signal).

See top picture.

Black clip to vehicle ground.

Start engine.

Oscilloscope must indicate a rectangular pulse.

See bottom picture.

Rectangular pulse present?

N>

Detach ignition-advance-unit plug.

See top picture.

Consecutively connect ohmmeter to:

Ignition-
advance-unit
plug

LE-Jetronic
control-unit
plug

Term. 5 and term. 1

Set value: approx. 0 Ω
(continuity)

Eliminate open-circuit.

LE-Jetronic
control-unit
plug

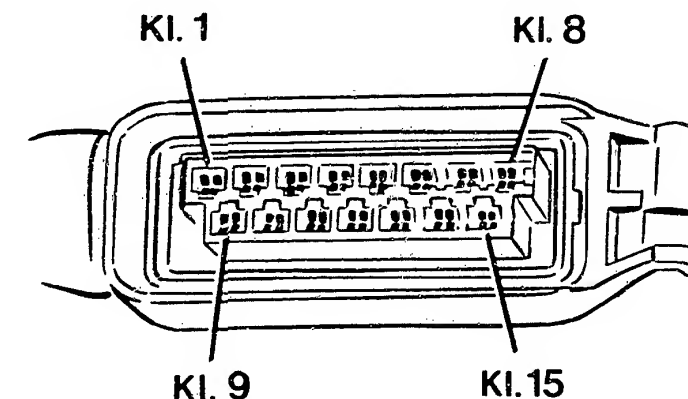
LE-Jetronic
control-unit
plug

Term. 1 and term. 5

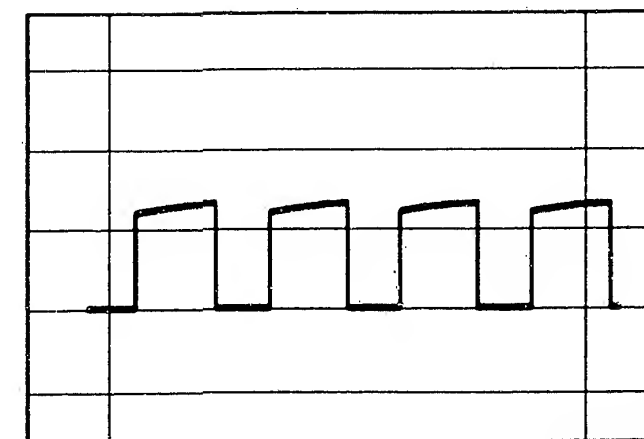
Set value: infinity Ω
(open-circuit)

Eliminate short-circuit to ground.

If there was no open-circuit or short-circuit to ground, renew ignition advance unit.



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227/0096

Return to trouble-shooting chart
B04

C05

<==>

C06

<==>

TROUBLE-SHOOTING PROGRAM (13)

V

Test primary signal.

Ignition-distributor, ignition-advance-unit and trigger-box plug connected.

Primary signal with oscilloscope

Connect oscilloscope in accordance with operating instructions to ignition coil term. 15 (+) and term. 1 (-).

Start engine.

Set value:

Oscilloscope must indicate a primary voltage (magnitude irrelevant).
See picture.

O R

Primary signal with engine-speed tester

Connect engine-speed tester in accordance with operating instructions to ignition coil term. 15 (+) and term. 1 (-).

Start engine.

Set value:

Engine-speed tester must indicate a value (magnitude irrelevant).

Primary signal present?

N>

Renew trigger box.



V

Return to trouble-shooting chart
B04

TROUBLE-SHOOTING PROGRAM (14)

Test basic ignition setting.

Engine at operating temperature
(oil temperature approx. + 80° C).

Switch off loads.

Switch off ignition.

Connect Motortester in accordance
with operating instructions.

Detach plug of throttle-valve
switch and connect shorting device
KDZS 0003 to detached plug.

See top picture, arrow.

Allow engine to idle.

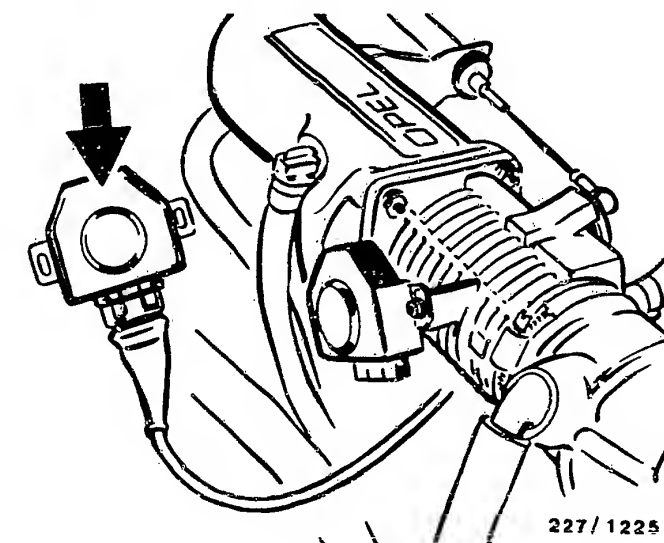
If using TDC sensor, read off
ignition angle or flash lamp
on to ignition marks.

Mark corresponds to 10° BTDC.
See bottom picture, arrow.

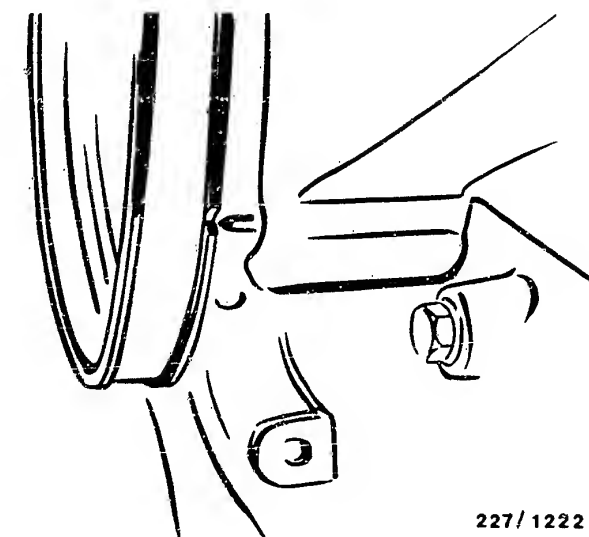
Set value: 10° ± 2° BTDC.

Is set value attained?

Correct basic ignition setting by
turning ignition distributor.



227/1225



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Return to trouble-shooting chart
B04

TROUBLE-SHOOTING PROGRAM (15)

Test control lead for characteristic-curve control.

Detach plug of temperature switch (oil) (top picture, arrow) and temperature switch (intake manifold) (center picture, arrow) and jumper both plugs in each case with auxiliary lead.

Detach ignition-advance-unit plug and connect voltmeter to term. 3 (+) and term. 7 (-). See bottom picture.

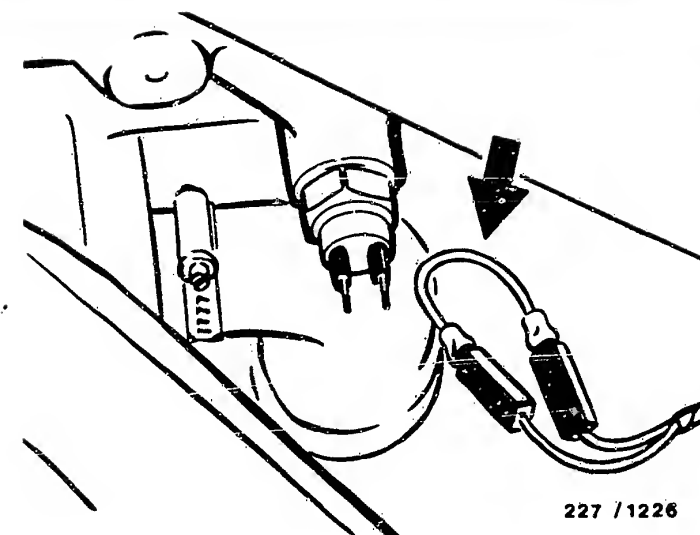
Switch on ignition.

Set value: Battery voltage

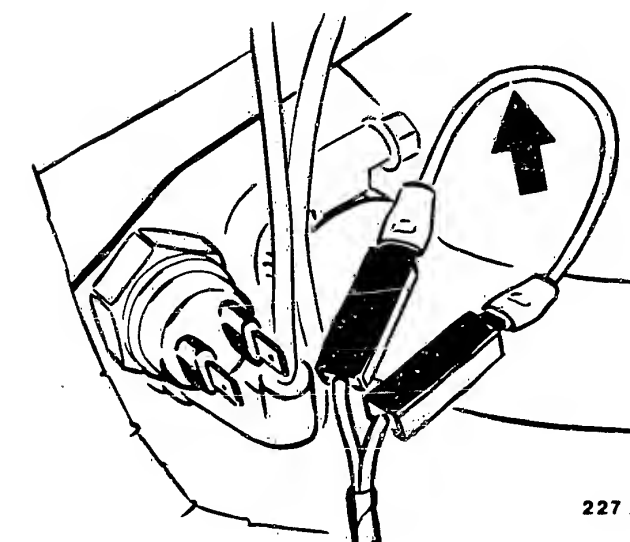
Is set value attained?

Return to trouble-shooting chart B04

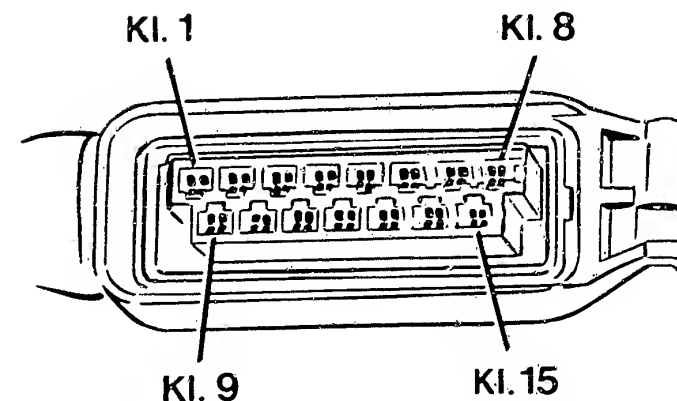
Test for open-circuit in lead from ignition-advance-unit plug term. 7 to temperature-switch plug (intake manifold) via temperature-switch plug (oil) including ground connection. Eliminate open-circuit.



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TROUBLE-SHOOTING PROGRAM (16)

Test temperature switch (oil).

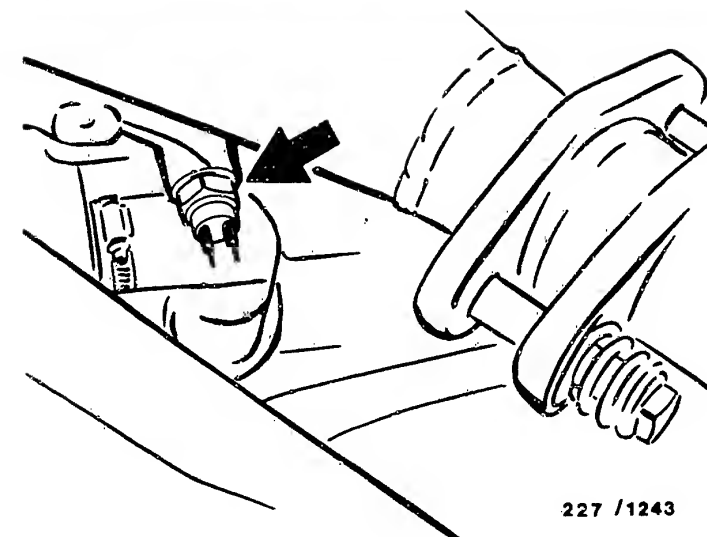
Temperature-switch plug detached.

Connect ohmmeter to both connections of temperature switch.
See picture, arrow.

Set value: See brief instructions

Is set value attained?

Renew temperature switch (oil).
(Tightening torque 20 Nm).



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Return to trouble-shooting chart
B04

C13

<=>

C14

<=>

TROUBLE-SHOOTING PROGRAM (17)

Test temperature switch (intake manifold).

Temperature-switch plug detached.

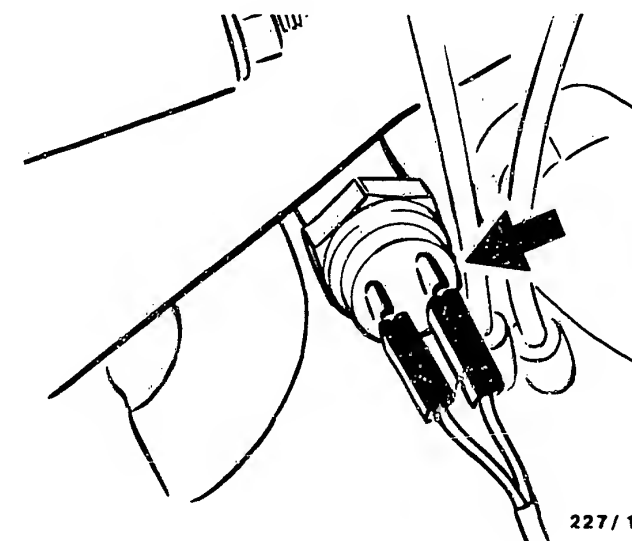
Connect ohmmeter to both connections of temperature switch.
See picture, arrow.

Set value: See brief instructions

Is set value attained?

N>

Renew temperature switch (intake manifold)
(Tightening torque 6 Nm).



227/1236/1

Return to trouble-shooting chart
B04

C15

<=>

C16

<=>

TROUBLE-SHOOTING PROGRAM (18)

Test throttle-valve switch (idle).

Detach LE-Jetronic control-unit plug.
See top picture.

Detach ignition-advance-unit plug and connect ohmmeter to term. 6 and term. 1.
See top picture.

Throttle valve is in idle position.

Set value: approx. 0 Ω
(continuity)

Open throttle valve 1...2°.

Set value: infinity Ω
(open-circuit)

Is set value attained?

N>

1. Detach throttle-valve-switch plug.
See bottom picture.

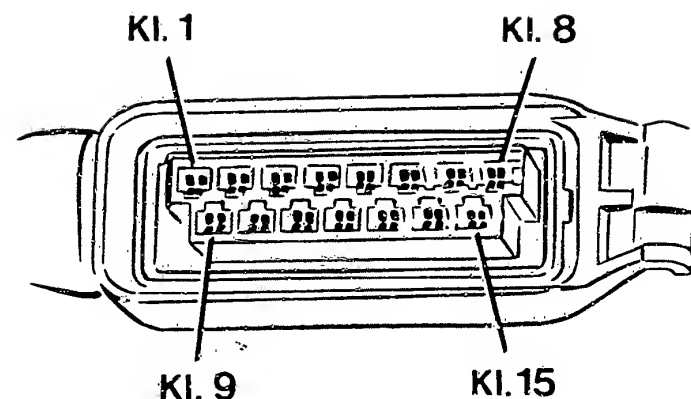
Connect ohmmeter consecutively to:

Throttle-valve-switch plug	Ignition-advance-unit plug
----------------------------	----------------------------

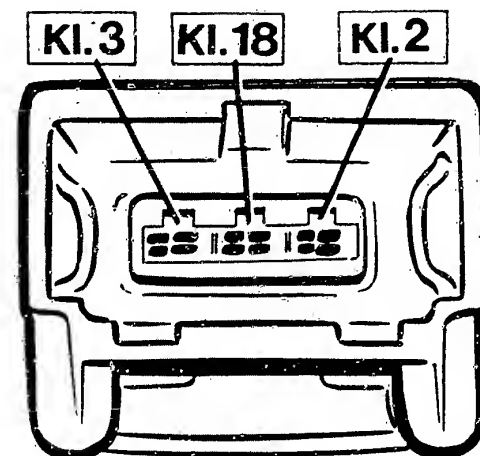
Term. 2	and	term. 6
Term. 18	and	term. 1

Set value: approx. 0 Ω in each case
(continuity)

Eliminate open-circuit.



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Return to trouble-shooting chart B04

Continued on next picture page

2. Connect ohmmeter to throttle-valve switch term. 2 and term. 18.

Throttle valve is closed.
Set value: approx. 0 Ω
(continuity)

Open throttle valve approx. 1...2°.
Set value: infinity Ω
(open-circuit)

If set value is not attained,
adjust throttle-valve switch.

P r o c e d u r e:

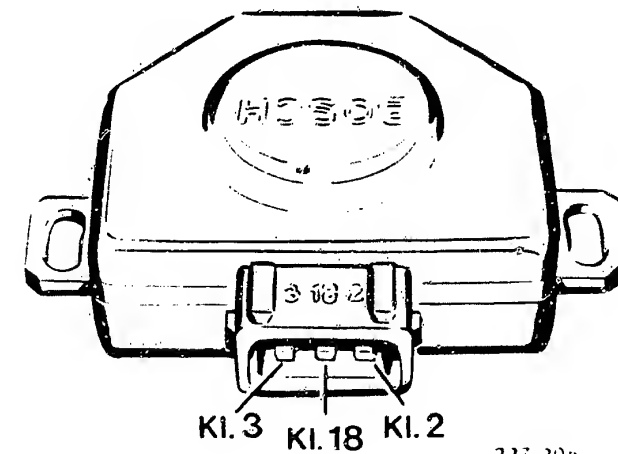
Loosen fastening screws of throttle-valve switch somewhat and turn throttle-valve switch until idle contact switches.

Set value: approx. 0 Ω
(continuity)

If set value is not attained, renew throttle-valve switch.
Tighten fastening screws of throttle-valve switch.

C h e c k :

Open throttle valve approx. 1...2°.
Set value: infinity Ω



Return to trouble-shooting chart
B04

TROUBLE-SHOOTING PROGRAM (19)

Test throttle-valve switch (full load).

Detach LE-Jetronic control-unit plug.
See top picture.

Detach ignition-advance-unit plug and connect ohmmeter to term. 14 and term. 1.
See top picture.

Fully depress accelerator pedal.

Set value: approx. 0 Ω
(continuity)

Release accelerator pedal (idle position).

Set value: infinity Ω
(open-circuit)

Is set value attained?

N>

1. Detach throttle-valve-switch plug.
See bottom picture.

Connect ohmmeter to:

Throttle- valve-switch plug	Ignition- advance-unit plug
-----------------------------------	-----------------------------------

Term. 3 and term. 14

Set value: approx. 0 Ω
(continuity)

Eliminate open-circuit.

2. Connect ohmmeter to throttle-valve switch term. 3 and term. 18.

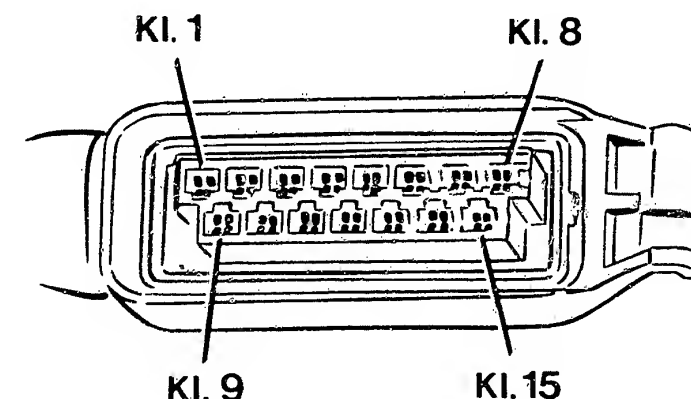
Fully depress accelerator pedal.

Set value: approx. 0 Ω
(continuity)

Release accelerator pedal
(idle position)

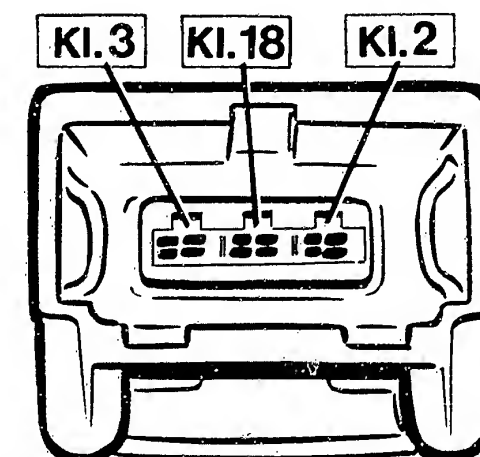
Set value: infinity Ω
(open-circuit)

If set value is not attained, renew throttle-valve switch.



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Return to trouble-shooting chart
B04



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TROUBLE-SHOOTING PROGRAM (20)

Test load signal
(with oscilloscope/dwell-angle
tester)

Detach ignition-advance-unit plug
and push back handle cover after
unscrewing fastening screws and
removing rubber seal.
See top picture.

Attach ignition-advance-unit plug.

Connect oscilloscope in program-
selector-switch setting "Special" in
accordance with operating
instructions.

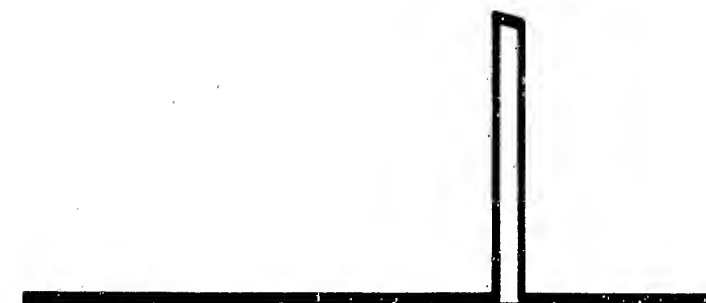
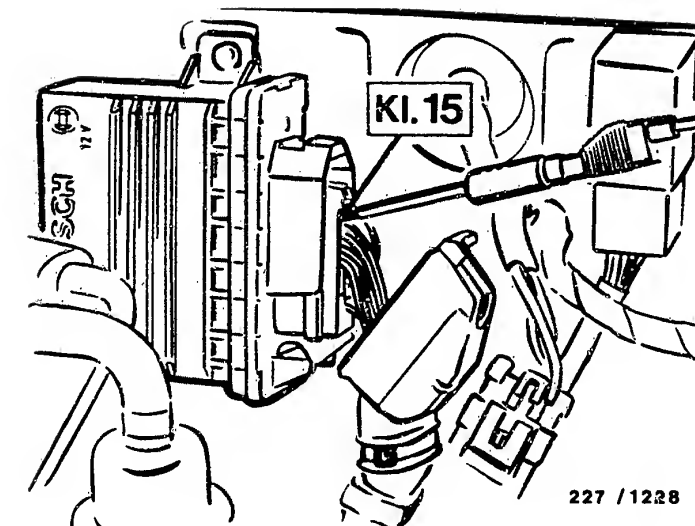
For example MOT 206:

Red clip to ignition-advance-unit
plug term. 15 (measurement signal).
See top picture.

Black clip to vehicle ground.

Allow engine to idle.

There must be a load signal.
See bottom picture.



Continued on next picture page



TESTING NOT NECESSARY IF TESTING
PERFORMED WITH OSCILLOSCOPE
(CONTINUATION IN NEXT BOX).

Connect dwell-angle tester in
accordance with operating
instructions:

For example:

Green clip to ignition-advance-unit
plug term. 15.

Yellow clip to battery positive.

Black clip to vehicle ground.

Allow engine to idle.

Read off and note down dwell angle.



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (20) CONTINUED (2)

Briefly accelerate to full throttle and observe load signal.
There must be a noticeable change in pulse duration.
See top picture, arrow.

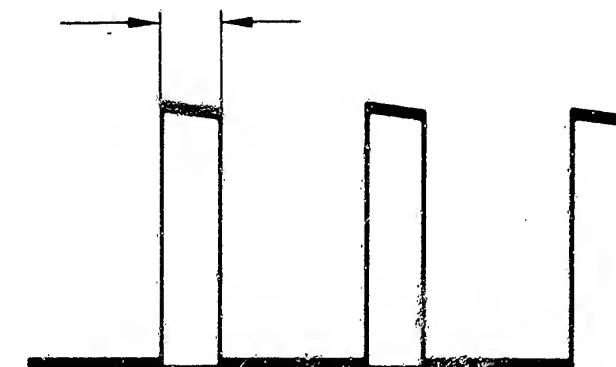
When using dwell-angle tester, there must be a noticeable change in the previously indicated dwell angle.
Is there a change in pulse duration/dwell angle?

N>

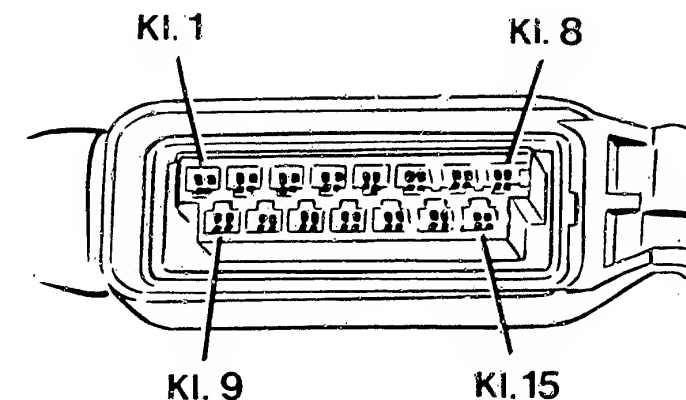
Detach ignition-advance-unit and LE-Jetronic control-unit plug.
Test for open-circuit and short-circuit to ground in lead from ignition-advance-unit plug term. 15 (bottom picture) to LE-Jetronic control-unit plug term. 10 (bottom picture).

Eliminate open-circuit/short-circuit to ground.

If there was no open-circuit or short-circuit to ground, renew LE-Jetronic control unit.



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Return to trouble-shooting chart
B04

C27

<==>

C28

<==>

TROUBLE-SHOOTING PROGRAM (21)

Test RON correction lead.

Detach ignition-advance-unit plug
and connect voltmeter to term. 3 (+)
and term. 8 (-).

Switch on ignition.

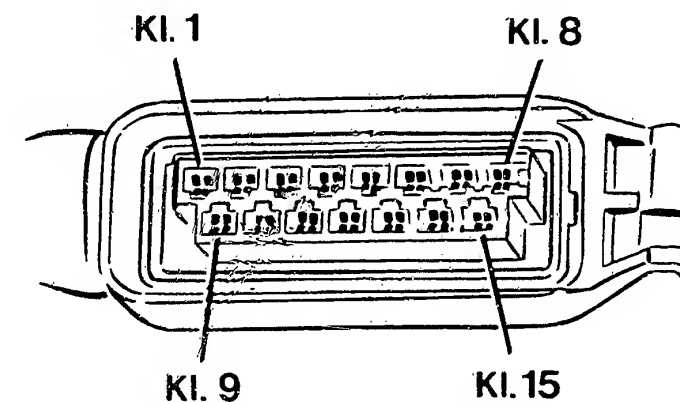
Set value: battery voltage

Is set value attained?

N>

Test for open-circuit in lead from
ignition-advance-unit plug term. 8
to vehicle ground.

Eliminate open-circuit.



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Return to trouble-shooting chart
B04

D01

<=>

D02

<=>

TROUBLE-SHOOTING PROGRAM (22)

Test trigger-box voltage.

Ignition-advance-unit plug connected.

Push back rubber sleeve of trigger-box plug and connect voltmeter to term. 3 (+) and term. 2 (-). See top picture.

Allow engine to idle.

Set value: 12..14 V or max. 1 V below battery voltage.

Is set value attained?

N>

Disconnect negative and positive lead of battery.

Detach trigger-box plug. See bottom picture.

Switch on ignition.

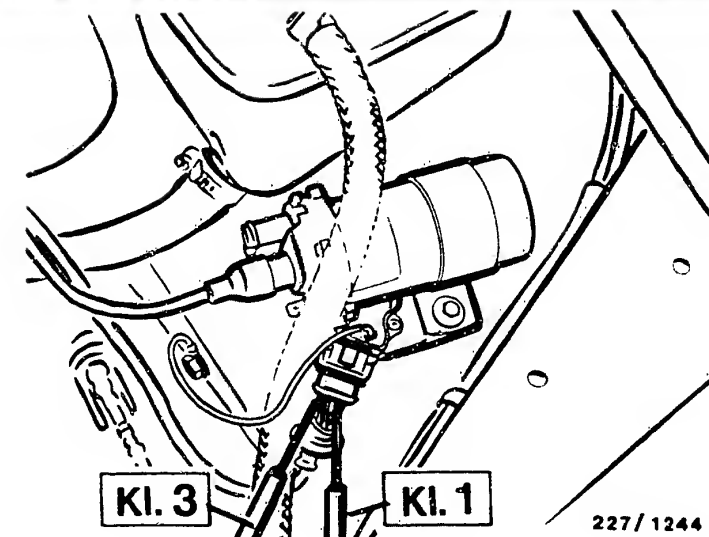
Test following leads for contact resistance:

1. From battery negative terminal to trigger-box plug term. 2

2. From battery positive terminal to trigger-box plug term. 3

Contact resistance when testing items 1 and 2
max. 0.3 Ω
(take account of resistance of test lead/test prods).

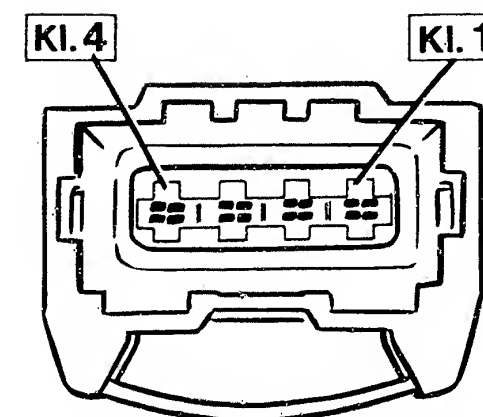
Eliminate contact resistances.



227/1244

Y

Return to trouble-shooting chart B04



227/1082

TROUBLE-SHOOTING PROGRAM (23)

Y

Test ignition-coil voltage.

Connect voltmeter to ignition coil term. 15 (+) and battery negative terminal (use connecting cable for ignition coil).

Allow engine to idle.

Set value: at least 10 V

Is set value attained?

N>

Detach positive lead of battery.

Switch on ignition.

Test for contact resistance in leads from battery positive terminal to ignition coil term. 15.

(Take account of resistance of test lead/test prods.)

Set value: max. 0,3 Ω

Eliminate contact resistance.

Y

Return to trouble-shooting chart
B04

D05

<==>

D06

<==

TECHNICAL BULLETIN

DANGER OF ACCIDENT ON SEMI-
CONDUCTOR IGNITION SYSTEMS

22
VDT-I-227/102 En
03.1981

Supersedes Feb. 3, 1976 edition

Please be sure to pass this bulletin
together with VDE 0104/7.67 enclosed on to your
employees for their attention.

The increased demands made on their ignition
systems by modern engines, and the wish for freedom
from maintenance, led some time ago to manufacturers
starting to equip their vehicles with semi-conductor
ignition systems as original equipment.
In most cases, the performance of nearly all
makes of such systems is higher than that of
conventional systems, and further improvements are
to be expected. This means that semi-conductor
ignition systems have reached the point where
contact with "live" components or terminals
(whether on the primary side or the secondary side)
can prove fatal.

In this connection, we should like to point out
to you that the laws valid in your country
regarding work on high-voltage systems must
be adhered to when working on, or testing,
semi-conductor ignition systems.

As a matter of principle, when working on such
ignition systems, the ignition is to be
switched off.

Included in such work are the following operations:

- * Connection of engine testing equipment
(timing strobe, dwell-tach tester, ignition
oscilloscope etc.)
- * Replacement of ignition system components
(spark plugs, ignition coil, ignition
distributor, H.T. ignition cables etc.)

If it is necessary to switch on the ignition
in order to test the system or make adjustments
on the engine (to the carburetor, for instance),
then lethal voltages are present throughout
the entire system.

This means that the danger of accident exists
not only at the individual components in the
system (e.g. ignition distributor, ignition
coil, trigger box, ignition harness), but also
at the wiring harness (e.g. connection for the
tachometer, diagnostic connector), on terminals,
and on test equipment.

In addition, in the case of the capacitor-discharge
ignition system (CDI), danger of accident is also
present under the following circumstances:

- * Operation of the trigger box without the
ignition transformer.
- * At the trigger box, (removed), relatively
soon after it has been switched off
(capacitor discharge).

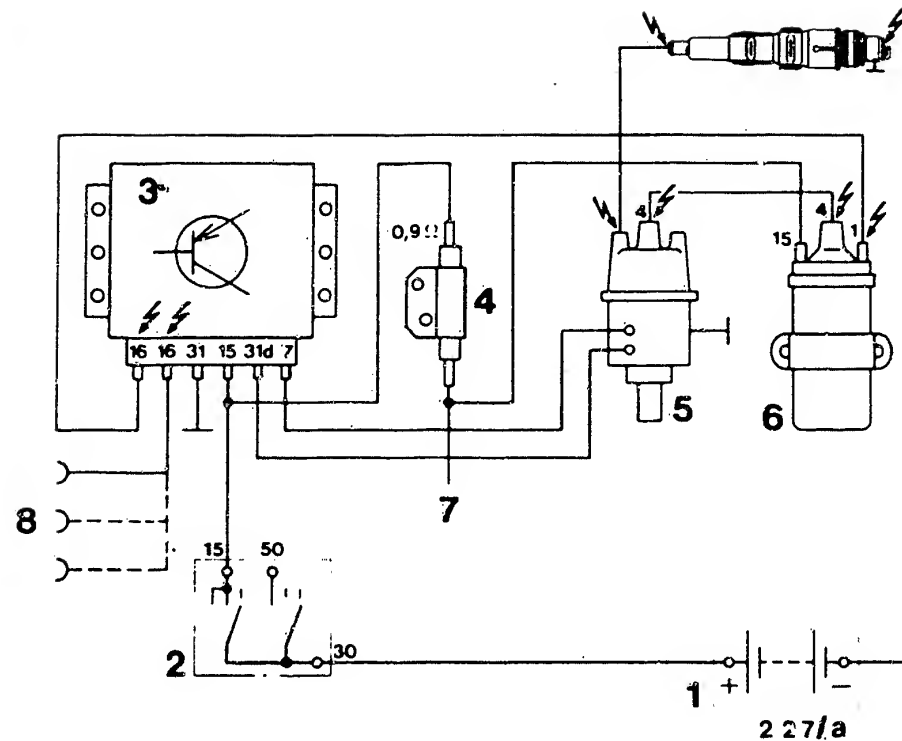
Below is a typical terminal diagram of a semi-
conductor ignition system, the dangerous
locations being marked with high-voltage arrows.

We would point out that all semi-conductor
ignition systems, even the older versions, are
to be regarded as dangerous in the sense as
defined by this bulletin.

EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En
01.1981

e.g. Ignition systems, Jetronic, Motronic, ABS



- 1 = Battery
- 2 = Ignition/starting switch
- 3 = Trigger box
- 4 = Resistor
- 5 = Ignition distributor
- 6 = Ignition coil
- 7 = to starting motor term. 15a
- 8 = to tachometer connection
or diagnostic plug
or TD terminal

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments
concerning the contents to our authorized
representative in your country.

Please ensure that this Bulletin is passed
on to your employees for their attention.

We have often been asked by some of our
customers whether or not patients with heart
pacemakers are endangered in any way by
ignition systems. This theme was recently
the subject of an examination carried out by
the Ignition System Development Department of
Robert Bosch GmbH in conjunction with Dr.
Thull, lecturer at the Central Institute for
Biomedical Technology at the University of
Erlangen-Nürnberg and Biotronic GmbH & Co.
of Berlin, a manufacturer of heart pacemakers.
The magazine "Biomedizinische Technik"
(5/80) published the results.

The most important discoveries in this practice
can be summarized from the examination report
as follows:

1. Heart pacemakers corresponding to the
latest state of the art are not affected
by radiation (electromagnetic fields) from
ignition systems.
2. With a stationary engine and the ignition
switched off, the heart pacemaker is not
affected by any part of the ignition system,
even when unintentionally touched. Main-
tenance work in the engine compartment, for
example, can then be carried out without
any danger.

3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.

4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers, please introduce the necessary measures.

We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

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TECHNICAL BULLETIN

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En
01.1983
Supersedes 5.1981 edition

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Coil ignition	ZS (CI)		Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I * (TCI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)
		H=Hall generator	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Transistorized ignition	TZ-I * (TI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in hybrid technique)	TZ-H * (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Breakerless semi conductor ignition with or without knock control	EZ (EI) (EZ-K) (EI-k)	K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributorless ignition with or without knock control	VZ (FEI) (VZ-K) (FEI-k)	K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

* Note:

The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

MOTOR VEHICLE SERVICE INFORMATION

INCORRECT DISPLAY OF ROTATIONAL SPEED, VDT-I-Gen. 030 En
AND DWELL ANGLE ONLY WITH TRIGGER 02.1981
BOXES 0 227 100 .. (TCI-l, TCI-h)
WITH CURRENT LIMITATION Supersedes ed. 6.1980

For additional information, see VDT-I Gen. 032 En

1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00	Rotational-speed	KTE 001.00
001.01	display O.K. with	001.02
001.02	these testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan	(Hitachi ignition system)
Fiat	(Delco ignition system)	Datsun	(Bosch ignition system)
Ford	(Delco ignition system)	Peugeot	(Bosch ignition system)
General Motors	(HEI ignition system)	VW	(Bosch/Fairchild ignition system)
			Bosch transistorized ignition system for retrofitting
			0 227 100 920

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representative in your country.

2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min^{-1} to 1200 min^{-1}).

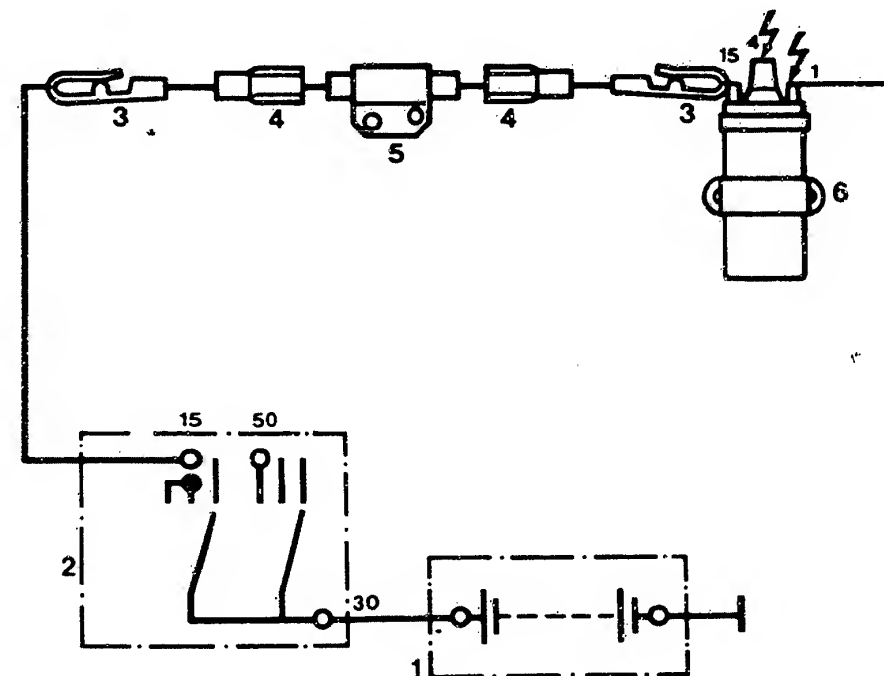
It is, however, possible to attain correct rotational-speed measurements:

Connect a ballast resistor of 0.9 or 1.0 Ohms (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohms	Part no. 0 227 900 002
or	
1 ballast resistor 1.0 Ohms	Part no. 0 227 900 101
2 blade receptacles	Part no. 1 901 355 881
e.g. approx. 0.2 m cable, 1.5 mm ² e.g.	Part no. 6 210 150 150
2 insulated clips	Commercially available



2 27/d

- | | |
|------------------------------|----------------------|
| 1 = Battery | 4 = Blade receptacle |
| 2 = Ignition/starting switch | 5 = Series resistor |
| 3 = Terminals | 6 = Ignition coil |

Danger arrows: Warning: 400 V...25 KV

2.2 Dwell angle

The dwell angle is electronically controlled.
The dwell angle is no longer measured.

2.3 Ignition timing

Is correctly indicated. Tester connections according to operating instructions.

Published by:

Robert Bosch GmbH
Division KH

After-Sales Service Department for
Training and Technology (KH/VSK)
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MOTOR-VEHICLE SERVICE INFORMATION

MOTORTESTER CONVERSION

VDT-I-Gen. 032 En

Incorrect indication of engine speed,

06.1980

dwell angle and ignition point

only with trigger boxes

0 227 100 .. (TCI-I, TCI-H) with current limitation

For additional information see

VDT-I-Gen. 030 of 06.1980

Concerns: Motortester EFAW 268

268 S 10

269

214 B

AE 2000

1. General

Please arrange for above-quoted motor-testers in your workshop as well as at your customers (e.g. motor-vehicle workshops, petroleum companies, gas stations, vocational schools etc.) to be converted. Conversion is subject to payment and is performed by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with installation of switch).

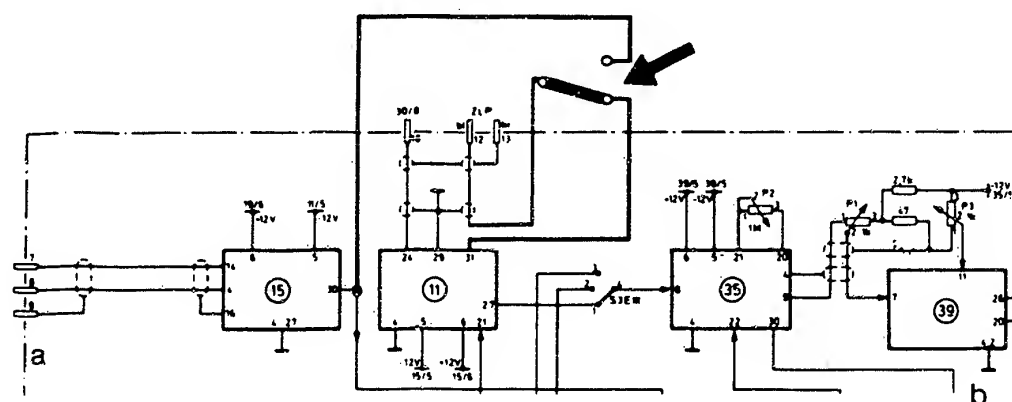
2. Why convert motortesters?

Transistorized ignition systems with current limitation have a different primary-voltage characteristic from conventional ignition systems. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values between 1.5 V and battery voltage (or greater), which, when checking the ignition system, may lead to an incorrect indication of engine speed and dwell angle and to incorrect triggering of the counter.

There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing strobe is triggered by the signal-path dwell-angle meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing strobe is triggered by the clamp-on action pickup and the pulse shaper stage.



227/e

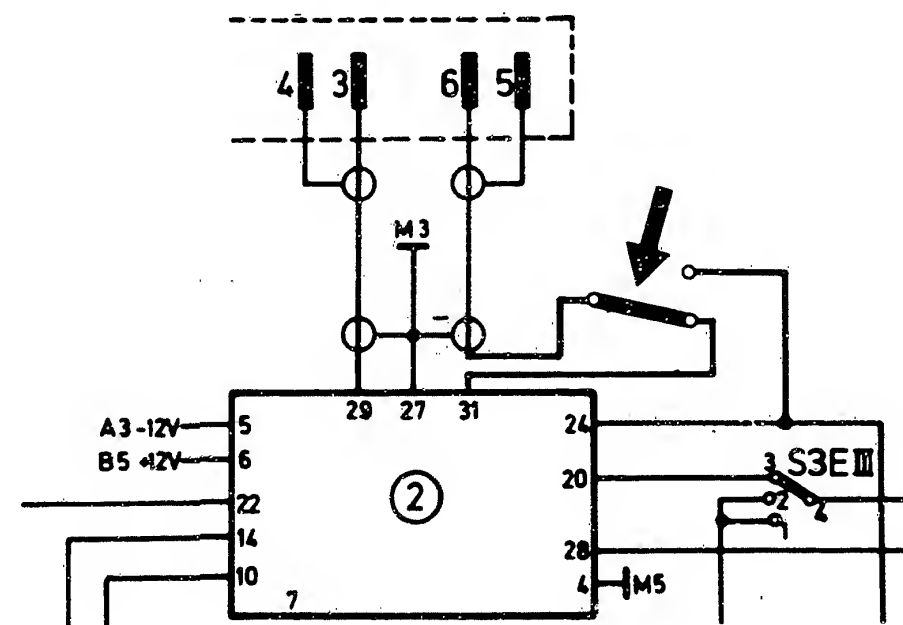
a = Clamp-on induction pickup
b = (Extract from WJF 508/1, Page 53)

EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.



227/f

(Extract from WJF 503/1, Page 64))

EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.

By fitting the switch with change-over contact in the front panel of the motortester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly:
e.g. "Standard" - "Current limitation".
These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "Standard".
All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "Current limitation".
In order to trigger the timing strobe, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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MOTOR VEHICLE SERVICE INFORMATION

TESTS ON ELECTRONIC IGNITION
SYSTEMS (TCI, TI)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
03.1981

The following tests are listed in older and current Tester operating instructions or in "Trouble-shooting with the oscilloscope":

- * "Separate ignition coil test"
(Concerns EFAW 213, 214, 268, AE 2000)
- * Calculating the "ignition voltage reserve"
(Concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- * "Intensified insulation test"
(Concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays, transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7 Information K7-VJF 17/8012.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
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continued on the following
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PUBLICATION INFORMATION

(c) 1988 ROBERT BOSCH GmbH Automotive Equipment -
After-Sales Service, Department of Technical
Publications KH/VDT, Postfach 10 60 50,
D-7000 Stuttgart 10.
Published by: After-Sales Service, Department for
Training and Technology (KH/VSK).
Press date 10.1988.
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Microfilmed in the Federal Republic of
Germany.
Microphotographié en République Fédérale
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